Chromium may prevent Type II diabetes onset

Type II diabetics produce ample insulin but can't process blood sugar properly. In people who risk developing this non-insulin-dependent diabetes, a chromium-rich diet can boost the insulin response and may prevent the disease, researchers reported this week.

Chromium consumption in the new study matched the upper limit of the recommended daily allowance for this trace metal. But most diets fall short of the recommended level, because few foods are chromium-rich, notes study leader Richard A. Anderson, a biochemist at the U.S. Department of Agriculture's Human Nutrition Research Center in Beltsville, Md. Moreover, his previous research has shown that diets high in simple sugars, such as glucose and fructose, rob the body of chromium, while those high in complex carbohydrates, such as pasta, preserve it.

The new research builds on a wealth of data from Anderson's laboratory showing that chromium supplementation in rats improves glucose tolerance – the ability to transport blood glucose into cells. The research team, which included scientists from Georgetown University in Washington, D.C., tested chromium's effects in humans by adding chromium chloride to the diet of 17 men and women, eight of whom had mild glucose intolerance, a condition that precedes diabetes.

During the 14-week study, all participants ate a baseline, chromium-poor diet containing less than 20 micrograms of the metal per day. This is similar to the amount consumed by 25 percent of Americans, Anderson says, noting that the recommended daily allowance ranges from 50 to 200 micrograms.

After four weeks, the researchers divided the volunteers into two groups. One group continued to eat the low-chromium diet, supplemented with daily doses of 200 micrograms of chromium; the other group stayed on the diet but received only placebo pills. Five weeks later, the groups were switched.

In seven of the eight people with glucose intolerance, tests taken an hour after they drank a sugary liquid showed that blood sugar levels rose nearly 50 percent less during chromium supplemention than at the outset of the study or during the unsupplemented baseline diet. In the 11 glucose-tolerant patients, the varying consumption of chromium had no effect on blood glucose levels, Anderson notes. This selective reduction, he says, indicates "chromium can reverse glucose intolerance."

Glucose-intolerant participants also showed lower circulating levels of insulin and glucagon – a pancreas-secreted compound that opposes insulin's action – during chromium supplementation than at any other point in the study, Anderson and Marilyn M. Polanksy reported this week at the annual meeting of the Federation of American Societies for Experimental Biology, held in Washington, D.C. They now plan to administer chromium to some Type II diabetics in the hope of reversing or lessening symptoms of the disease.

The team previously demonstrated in humans that chromium increases the number of cell receptors for insulin, and Anderson conjectures that this phenomenon may explain the metal's role in boosting insulin action and reducing glucose intolerance. A few foods, including broccoli and some fruits, beers and wines, contain higher-than-average levels of chromium, he says. However, cautions dietitian Kay Stoddard-Gilbert of Nevada's Division of Aging Services in Reno, the body cannot readily absorb all dietary forms of chromium. For example, much of the chromium in potatoes never gets incorporated into the body's cells, she told SCIENCE NEWS.

Rather than gorging on a few chromium-rich foods, Anderson suggests, the best way to enhance the body's supply is to limit simple sugars, which cause the body to excrete large amounts of the mineral. *– R. Cowen*

Low-magnesium diet may clog heart arteries

For years, animal studies have suggested that diets low in magnesium – a mineral typically deficient in the U.S. diet – may foster atherosclerosis. Now, a rabbit study has identified several physiological changes associated with magnesium deficiency that appear to conspire with cholesterol to promote coronary artery disease.

Epidemiologic studies have indicated that people who drink soft water – low in minerals such as magnesium and calcium – average more heart attacks and strokes than those drinking mineral-rich hard water (SN: 9/21/85, p. 187). Hoping to tease out why, Bella and Burton Altura at the State University of New York at Brooklyn and their co-workers focused on rabbits, which are particularly susceptible to artery-clogging atherosclerosis.

One-third of the animals ate standard rabbit chow, another third the same chow laced with 1 percent cholesterol, and the rest chow supplemented with 2 percent cholesterol. In each group, one-third of the rabbits received sufficient magnesium, one-third got only 60 percent of their recommended daily allowance, and the rest got almost three times the recommended daily allowance.

Only rabbits eating cholesterol developed atherosclerotic damage in the aorta, a major heart artery. The magnesium-deficient animals consistently developed the most and thickest aortic deposits; those on the highest-magnesium diets developed the fewest and thinnest deposits. And for each magnesium category – low, sufficient or high – eating more cholesterol resulted in more lesions. Moreover, the researchers report in the March PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES (Vol.87, No.5), atherosclerosis was poorly correlated with serum cholesterol and highly dependent on dietary magnesium.

Only the cholesterol-supplemented animals showed a magnesium-dependent buildup of macrophages, or debris-scavenging white blood cells, in the liver and spleen, the team found. The lower the dietary magnesium, the more macrophages an animal produced. Previous studies have implicated macrophages as a source of the cholesterol-rich "foam cells" associated with atherosclerotic lesions.

The researchers add that "an unexpected and, we believe, significant observation was that animals fed a high-cholesterol diet exhibited an increase in serum magnesium levels, compared to their respective controls, irrespective of the magnesium levels in their diet." They suggest that these "serum concentrations seem to reflect a depletion of tissue magnesium" – probably a robbing of the mineral from smooth-muscle tissue in blood vessels, Burton Altura says. His previous studies have shown that magnesium is essential to maintaining the integrity of membranes in smooth-muscle cells.

Mildred Seelig, executive director of the American College of Nutrition in Wilmington, N.C., calls the report "a strong paper" and "a very exciting one." Its link between atherosclerosis and low-magnesium diets confirms scores of studies in other animals and is consistent with observations made in several human studies, she says.

Because researchers often measure magnesium in blood serum, Seelig was intrigued by the possibility that a deficiency might draw magnesium into the serum from stores in the body's soft tissue. This, she says, might explain why many epidemiologic studies fail to find a magnesium deficiency where it might have been expected – for instance, in people drinking soft water.

James C. Fleet, a nutritional biochemist at the Agriculture Department's Human Nutrition Research Center in Boston, says he finds the study interesting though puzzling. He notes, for example, that when he gives rabbits high-cholesterol diets, they develop "a general sickness," whereas the new report describes the high-cholesterol rabbits as appearing healthy. *– J. Raloff*